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(54) **SEARCH RESULTS THROUGH INTEREST CIRCLES**

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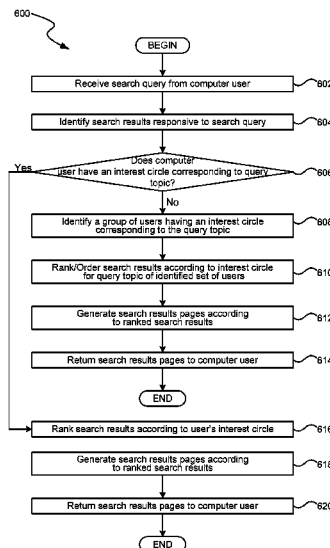
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(57) **ABSTRACT**

Systems, methods, and computer-readable media for responding to a search query with search results ranked according to interest circles of a plurality of computer users are presented. Interest circles are formed from a computer user's navigation data, including the computer user's navigation history. A search query is received from a requesting computer user. The search query is directed to a query topic or set of query topics. A set of search results responsive to the search query are obtained. A plurality of computer users, each of the plurality of computer users having an established interest circle corresponding to the query topic, is identified. The set of search results are then ordered according to the interest circles of the identified plurality of computer users. Thereafter, the higher ordered search results are returned to the requesting computer user in response to the search query.

**18 Claims, 8 Drawing Sheets**



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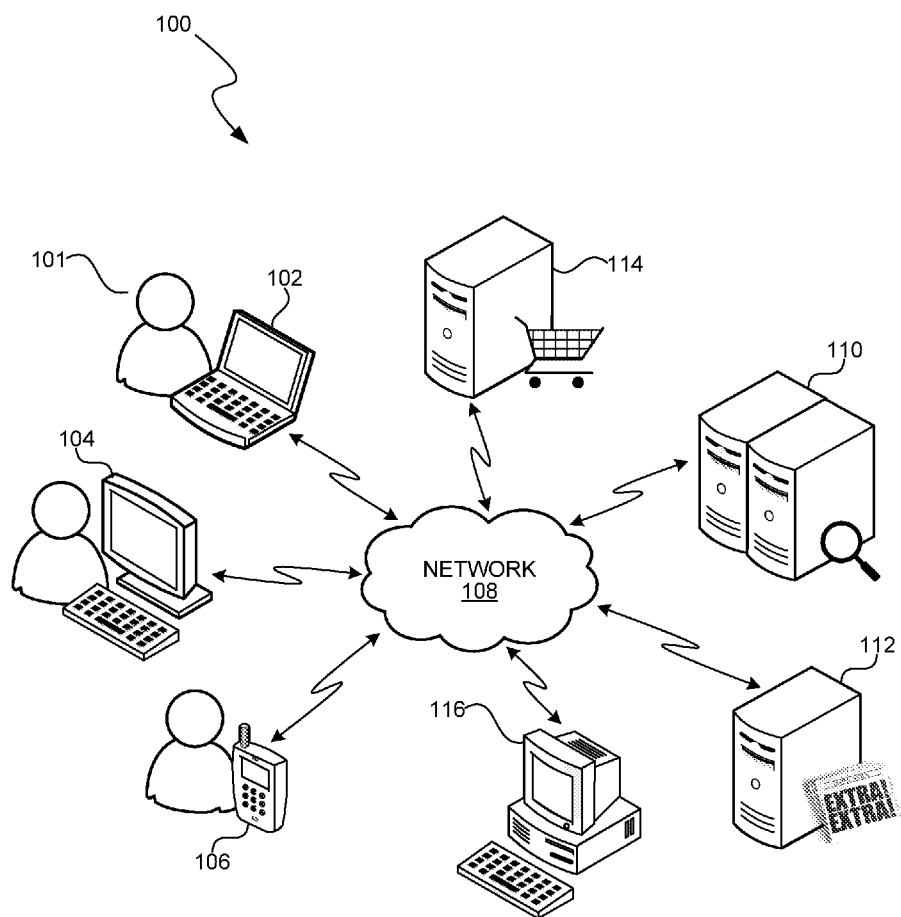
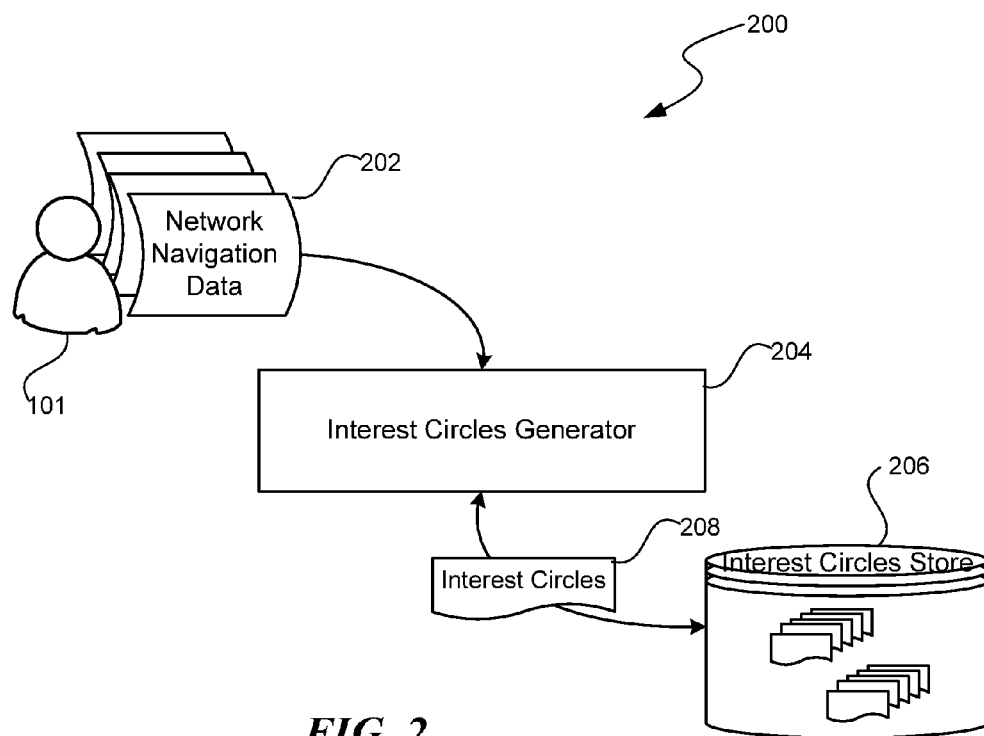
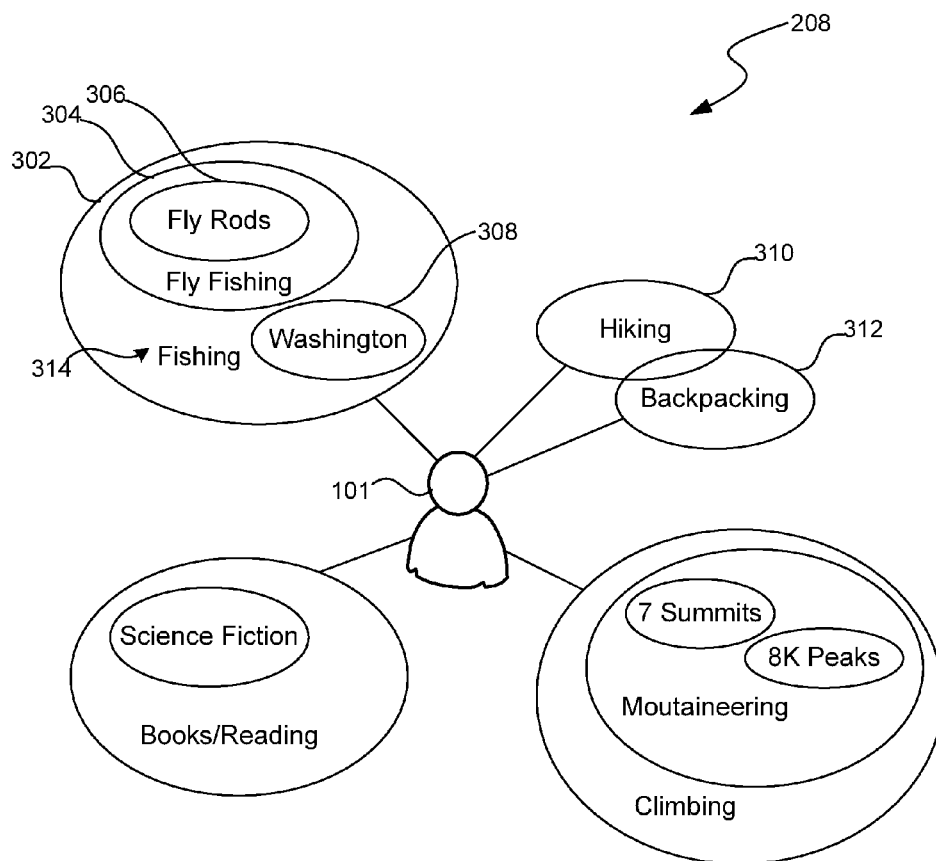


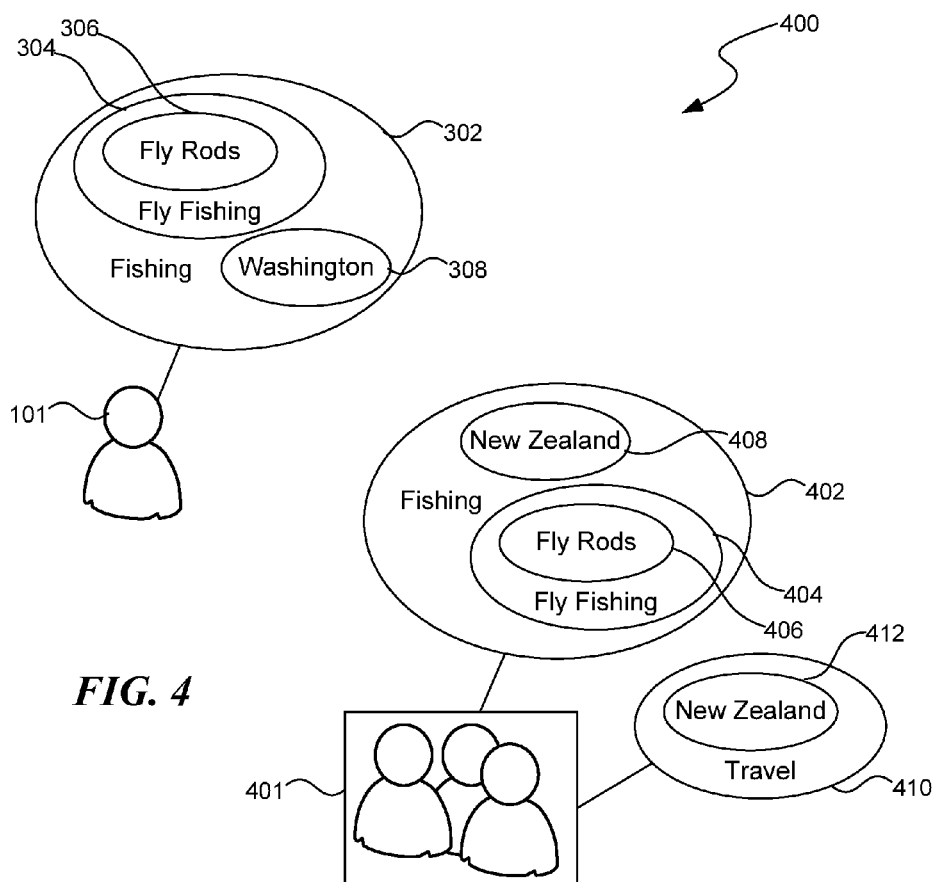
FIG. 1

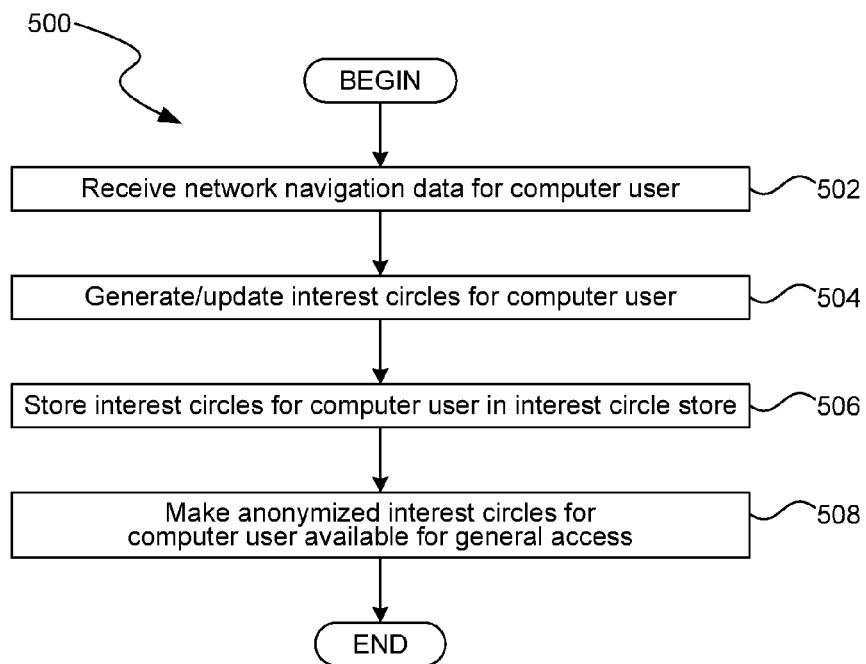


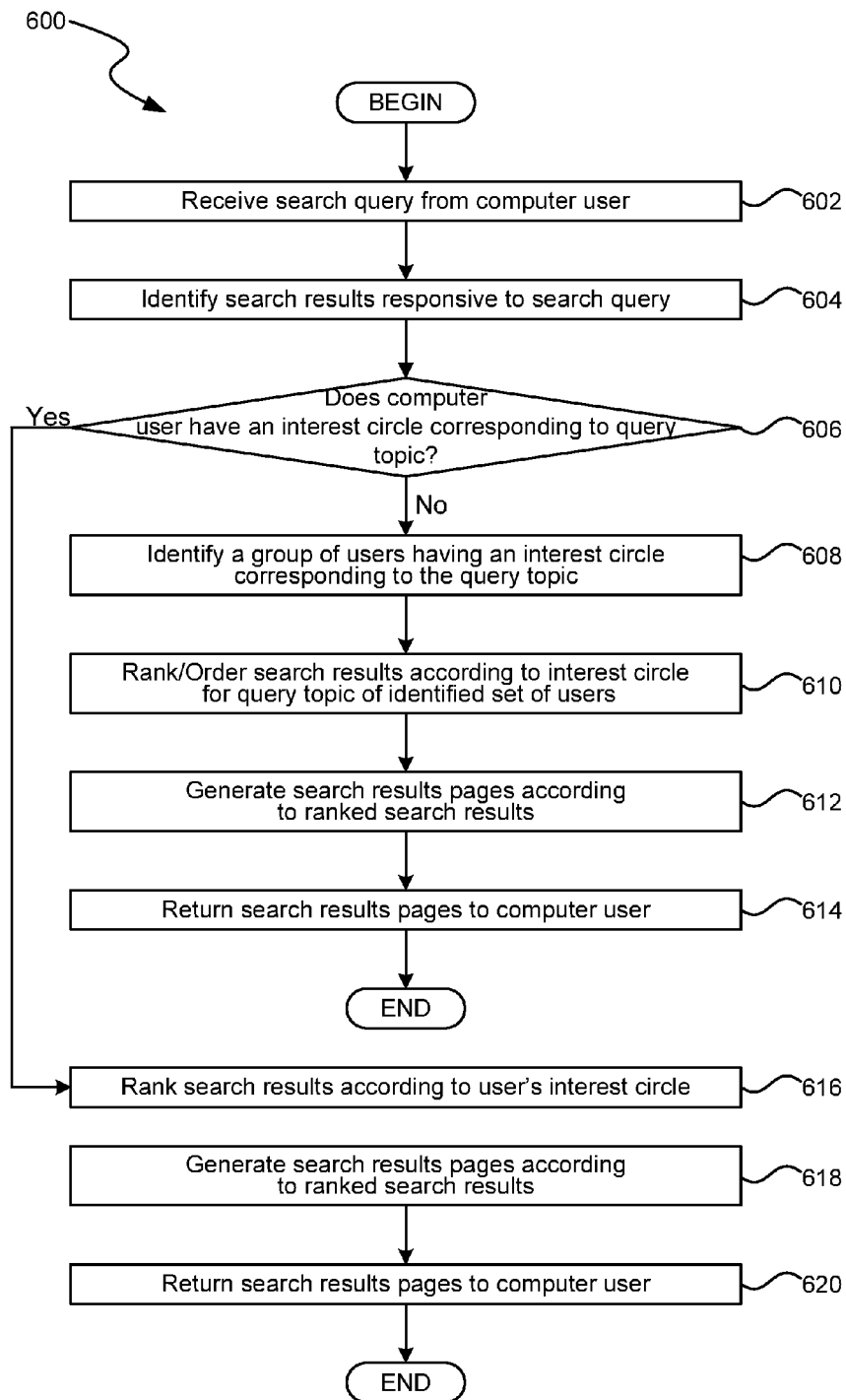
**FIG. 2**



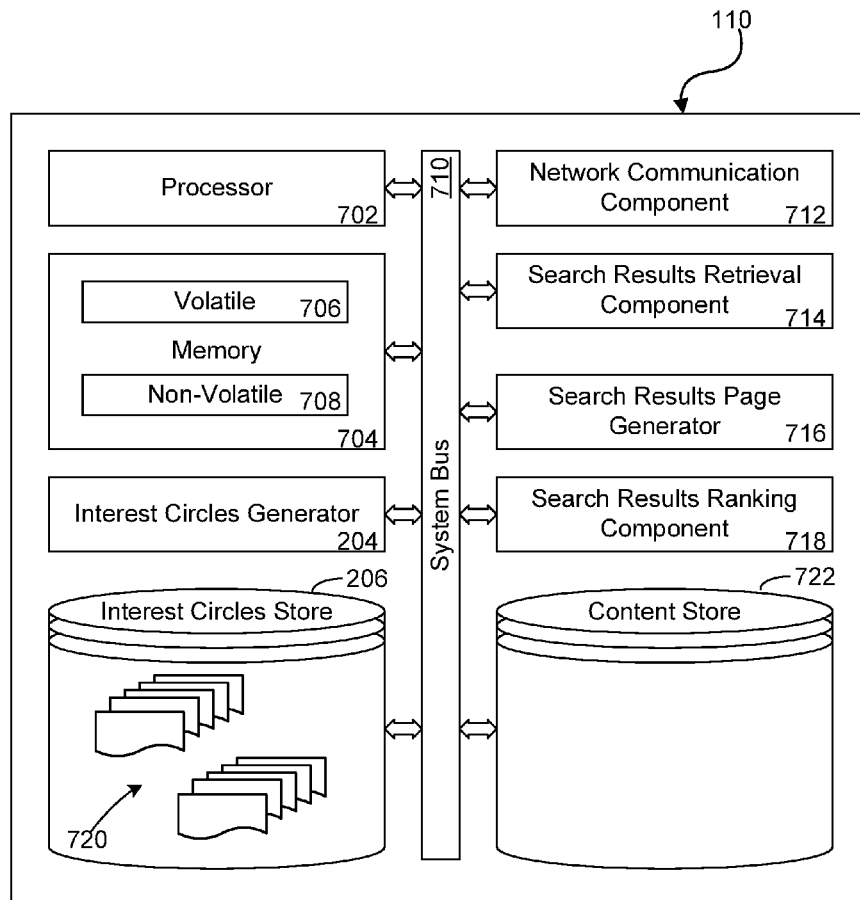
**FIG. 3**

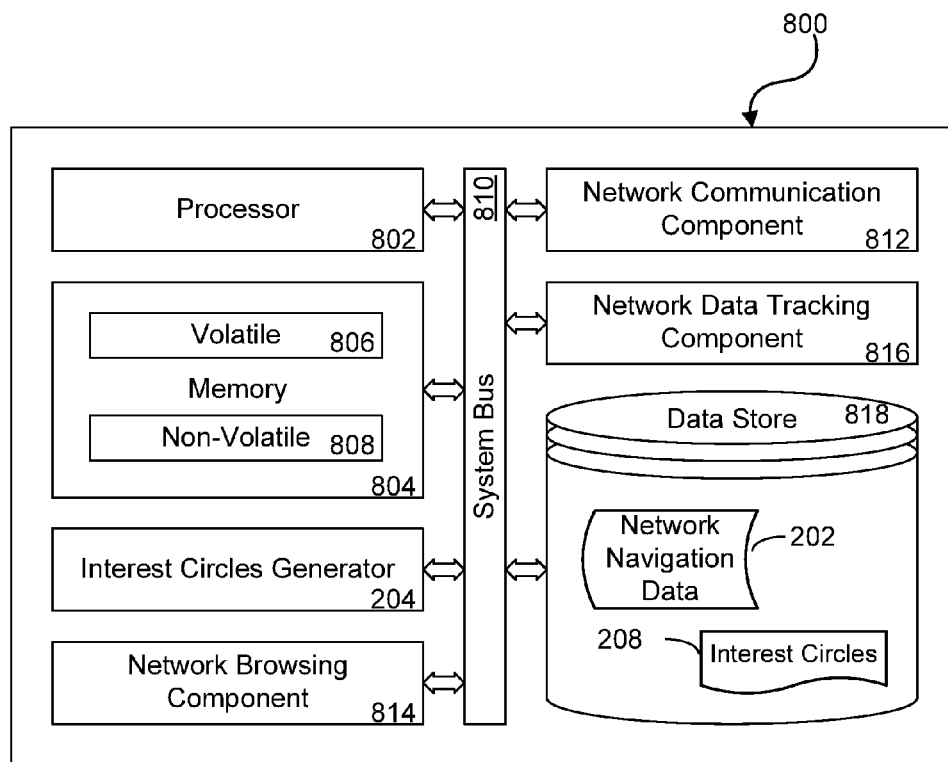


**FIG. 5**

**FIG. 6**



**FIG. 7**

**FIG. 8**

## SEARCH RESULTS THROUGH INTEREST CIRCLES

### BACKGROUND

The basic model of search engines is to receive a search query from a computer user, identify search results corresponding to the subject matter or topic of the search query, and generate and return one or more web pages of search results based on the identified search results. Indeed, beyond the basic model, to improve the user experience and keep the computer user returning to the search engine, most search engines rank and sort the identified search results in an effort to present the most relevant search results to the user in the first search results page. If the desired result (or a desired result) is found on the first search results page, the user is not forced to iterate through multiple pages searching for the search result (or search results) that is desired.

Search engines use a variety of methods, techniques, and heuristics to tailor search results according to a specific computer user's interests. By tailoring the search results to the computer user's preferences the most relevant and, therefore, desirable search results are presented to the computer user in the first search results page (or at least one of the early search results pages.) One technique is to look to the computer user's social network for preferences. However, when the computer user has no specific preference and/or history with a particular topic, and if the computer user's social network similarly has no preference or history with regard to the search topic, tailoring the search results to the computer user can be challenging and often reverts to simply web page popularity.

### SUMMARY

The following Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. The Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

According to aspects of the disclosed subject matter, method, systems, and computer-readable media, configured for responding to a search query with search results ranked according to interest circles of a plurality of computer users, are presented. A search query is received from a requesting computer user, where the search query is directed to a query topic or set of query topics. Search results responsive to the search query are obtained. The set of search results are then ordered according to the interest circles of an identified plurality of computer users. Thereafter, the higher ordered search results are returned to the requesting computer user in response to the search query.

According to additional aspects of the disclosed subject matter, methods, systems, and computer readable media, configured for responding to a search query with search results ranked according to interest circles of a plurality of computer users, are presented. Network navigation data corresponding to a plurality of computers users is obtained, and for each of the plurality of computer user the set of interest circles is identified and stored. A search query is received from a requesting computer user, where the search query is directed to a query topic or a set of query topics. Search results responsive to the search query are obtained. The set of search results are then ordered according to the interest circles of an identified plurality of computer users. Thereafter, the higher

ordered search results are returned to the requesting computer user in response to the search query.

### BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing aspects and many of the attendant advantages of the disclosed subject matter will become more readily appreciated as they are better understood by reference to the following description when taken in conjunction with the following drawings, wherein:

FIG. 1 is a block diagram illustrating an exemplary networked environment suitable for implementing aspects of the disclosed subject matter;

FIG. 2 is block diagram illustrating the process flow of a computer user's network navigation data to interest circles that are stored in an interest circles store;

FIG. 3 is a block diagram illustrating an exemplary set of interest circles for a computer user;

FIG. 4 is a block diagram illustrating exemplary interest circles for a computer user in comparison to the interest circles of a group of computer users;

FIG. 5 is a flow diagram illustrating an exemplary routine for processing the network navigation data of a computer user into one or more interest circles corresponding to the computer user;

FIG. 6 is a flow diagram illustrating an exemplary routine for responding to a search query from a requesting computer user with search results ranked and ordered according to the interest circles of other computer users;

FIG. 7 is a block diagram illustrating an exemplary search engine configured according to aspects of the disclosed subject matter; and

FIG. 8 is a block diagram illustrating a computer user computing device configured to track navigation data corresponding to the computer user as well as generate interest circles for the computer user.

### DETAILED DESCRIPTION

For purposed of clarity, the use of the term "exemplary" in this document should be interpreted as serving as an illustration or example of something, and it should not be interpreted as an ideal and/or a leading illustration of that thing.

An interest circle should be understood as being a set of network references corresponding to a particular topic comprising network sites, universal resource locators (URLs), network-available content, online services, and the like. An interest circle is generated for a computer user based on navigation data for the computer user. The navigation data corresponds to network sites, locations, content, and services accessed by the computer user. In addition to location information, the navigation data may further include computer user interaction data with the various locations, such as hyper-link selections, products purchased at a particular network site, content that is retrieved and/or downloaded, the frequency of visits and interaction, and the like. A computer user's navigation data is tracked (typically by the computer user's computing device) and used to generate interest circles for the computer user. Gathering/tracking navigation data for a computer user continues over time and, correspondingly, interest circles for the computer user are updated over time.

As a computer user explores some new aspect in his/her life, the computer user will often search the Internet for information. In particular, the computer user will often turn to a search engine to find online information about a specific topic. While the search engine may have a user profile corresponding to the computer user, if the user is searching for

information on a new topic the search engine will not have learned any preferences regarding the topic of the computer user's prior searches (or online activity). Moreover, it is often the case that the user may not have a well-established social network of that the user's social network does not exhibit any experience and/or preferences toward a particular topic. Rather than giving generic answers that may or may not be relevant to the computer user, a search engine configured according to aspects of the disclosed subject matter can identify a set of computer users from the many computer users for whom an interest circle corresponding to the query topic (or query topics) has been established, and use the interest circles of the identified computer users to provide more relevant search results to the computer user. According to aspects of the disclosed subject matter, the set of computer users are identified independent of any social network or other established relationships with the computer user.

Turning now to the figures, FIG. 1 is a block diagram illustrating an exemplary networked environment **100** suitable for implementing aspects of the disclosed subject matter, including responding to a computer user's search query with search results having improved relevancy based on interest circles. The illustrative networked environment **100** includes one or more user computers, such as user computers **102-106**, connected to a network **108**, such as the Internet, a wide area network or WAN, and the like. Also connected to the network **108** is a search engine **110** configured to provide search results in response to search queries received from one or more computer users, such as computer user **101** by way of user computer **102** over the network **108**. According to aspects of the disclosed subject matter, the search results provided to the computer user from the search engine **110** in response to a search query will be improved through the use of interest circles of one or more other computer users.

Those skilled in the art will appreciate that, generally speaking, a search engine **110** corresponds to an online service hosted on one or more computers, or computing systems, located and/or distributed throughout the network **108**. The search engine **110** receives and responds to search queries submitted over the network **108** from various computer users, such as computer user **101** using user computer **102** over the network **108**. In particular, responsive to receiving a search query from a computer user, the search engine **110** obtains search results information related and/or relevant to the received search query (as defined by the terms of search query.) The search results information includes search results, i.e., references (typically in the form of hyperlinks) to relevant and/or content available at various network locations located throughout the network **108**, such content sites **112-116**. The content sites may include (by way of illustration and not limitation): news outlets/portals/sources, such as content site **112**; online shopping sites, such as online shopping site **114**; personal blogging and post sites, such as blogging site **116**; social media sites (not shown); educational and research sites (not shown); and the like.

As mentioned above, as a computer user, such as computer user **101**, navigates to the various networked content sites **112-116**, the computer user's navigation history is tracked. In at least one embodiment, the computer user's computing device, such as computing device **102**, is configured to track and compile the computer user's navigation data that is used to generate the interest circles for the computer user.

In addition to providing search results in response to a search query, the search engine **110** is further configured to receive network navigation data for a plurality of computer users, such as the computer user's associated with user computers **102-106**. As the number of computer users that submit

network navigation data to the search engine **110** increases, so too do the number of interest circles that are developed (a set of interest circles for each of the computer users) and the more likely that the search engine will be able to locate more relevant search results.

In regard to generating a set of interest circles for a computer user, FIG. 2 is block diagram illustrating the process flow **200** of a computer user's network navigation data to interest circles that are stored in an interest circles store. As shown in FIG. 2, a computer user's network navigation data, such as the network navigation data **202** for computer user **101**, is provided to an interest circles generator **204** (which may be part of a suitably configured search engine **110** but, alternatively, may be implemented as a separate service). In yet an alternative embodiment, the interest circles generator **204** may be included as part of a computer user's computing device, such as computing device **102**. As suggested above, in at least one embodiment, a computer user's navigation data is tracked and recorded on the computer user's computer. This information is then provided to the interest circles generator **204**. The interest circles generator **204** evaluates and analyzes the computer user's network navigation data **202** in order to identify one or more interest circles (i.e., a set of interest circles **208**) for the computer user **101**. The set of interest circles **208** is stored in an interest circles store **206** along with interest circles for other computer users.

According to one embodiment of the disclosed subject matter, each set comprises one or more interest circles. Each interest circle has a topic and one or more network references, including network sites, which correspond to that topic. Generally speaking, associated with each network site in an interest circle is a value indicating the importance of the network site to of the interest circle. This importance value is determined by the interest circles generator **204** in evaluating and analyzing the computer user's network navigation data **202**. According to various aspects of the disclosed subject matter, the importance of a network site may be based on the frequency of visits that the computer user made to the network site, the amount of activity of the computer user at the network site, the importance or significance of the computer user's activity at the network site (i.e., if the computer user purchased a particular item, "liked" a particular entity, etc.), the unusual-ness of the activity at a particular site, and the like.

Turning to FIG. 3, FIG. 3 is a block diagram illustrating an exemplary set **300** of interest circles for a computer user **101**. As can be seen in the exemplary set **300**, a computer user **101** may have any number of interest circles (such as interest circles **302-312**). As already mentioned, each interest circle is associated with a topic (such as topic **314** "fishing") and includes one or more network sites (not shown.) Moreover, for each interest circle (having a corresponding topic) there may be one or more additional interest circles corresponding to sub-topics. For example, interest circle **302** which corresponds to topic **314** "fishing" encompasses interest circles **304-308**, each of which includes a sub-topic of topic **314** "fishing." As previously mentioned, interest circles include information regarding network sites. However, as shown by the overlap of interest circles **310** and **312**, a particular network site may be found in more than one interest circle. Inclusion of a network site in an interest circle depends on the content/subject matter of the network site.

While the search engine **110** maintains the association of the computer user **101** to the user's set of interest circles **208**, the sets of interest circles stored in the interest circles store **206** are anonymized (i.e., the information is modified or obscured in a fashion such that the corresponding computer

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user can remain anonymous). In this way, the interest circles of all users can be utilized to improve relevance of search results for a computer user without revealing identifying information as to their sources (i.e., the computer users to which the various sets of interest circles belong). In at least one embodiment, in the case that there is not a minimum threshold of computer users having an interest circle for a particular query topic, the interest circles for that query topic may be excluded from use in improving search results in order to protect user privacy.

In regard to the process flow **204** (FIG. 2), in addition to generating an initial set of interest circles for a computer user **101** based on the computer user's network navigation data, the interest circles generator **204** may first determine whether a set of interest circles has already been generated for the computer user. If so, the set of interest circles may be included in the analysis/evaluation of the network navigation data **202** and an updated set of interest circles are stored in the interest circles store **206**.

In using interest circles to improve relevance of search results, a search engine will obtain the interest circles of the requesting computer user (i.e., the computer user that has submitted a search query to the search engine) and determine whether the user has already established an interest circle for the search topic, the subject matter of the search query. If not, the search engine identifies a plurality of sets of interest circles corresponding to other computer user that have an established interest circle corresponding to the search topic. According to aspects of the disclosed subject matter, in locating sets of interest circles that include an interest circle corresponding to the search topic, the search engine **110** identifies computer users that have interest circles in common with the requesting computer user in addition to an interest circle covering the search topic. To illustrate, reference is made to FIG. 4.

FIG. 4 is a block diagram **400** illustrating exemplary interest circles **302-308** for a computer user **101** in comparison to the interest circles **402-412** of a group of computer users **401**. As will become apparent through the subsequent discussion, generally speaking, the group **401** of computer users is formed because they (the members of the group) each have an established interest circle with regard to the query topic, irrespective of any user-established relationship with the requesting computer user. Moreover, for this example it is assumed that the search/query topic is "Fishing in New Zealand." As can be seen in the diagram **400**, computer user **101** has an interest circle **302** corresponding to "fishing" as well as an interest circle **308** correspond to "Washington." However, computer user **101** lacks any predetermined interest in regard to "Fishing in New Zealand." In response, the search engine **110** identifies a group **401** of computer users whose interest circles include both "fishing" (interest circle **402**) as well as "fishing in New Zealand" (interest circle **408**), which covers the search topic. Moreover, as can be seen, there is at least some additional overlap between the requesting computer user's interest circles (including interest circles **304** and **306**) and the interest circles of the group **401** of computer users, including interest circles **404** and **406**.

In regard to identifying members of the group **401** of computer users that have interest circles directed to the query topic, it is often advantageous to select computer users that have at least a threshold of interest circles in common with the requesting computer user. As shown in FIG. 4, the group **401** of computer users that has been identified as having an interest circle **408** directed to the example query topic also has other interest circles in common with requesting computer user **101**. Indeed, the interest circles **302-306** for requesting

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computer user **101** are also common to the group **401** of computer users, in particular interest circles **402-406**. Of course, the common interest circles illustrated in FIG. 4 are generally related to the query topic, "fishing in New Zealand." A non-limiting example of a threshold in similarity or commonality may be that at least 30% of the interest circles of the requesting computer user are common to those of each of the members of the group **401** of computer users.

While it may be advantageous to find a group of computer users having common interest circles with the requesting computer user that area related to the query topic, it is not a requirement. Indeed, there may be instances when a set of computer users have an interest circle regarding a particular topic but do not have a threshold amount of common interest circles with the requesting computer user and yet it is still advantageous to rely on that set of computer users. For example, there may exist a group of computer users that are considered experts with regard to a particular topic. When a search query from a requesting computer user is received, it may be disadvantageous to not include the interest circles of the experts with regard to the query topic simply because they do not otherwise have a threshold commonality between interest circles with the requesting computer user. Accordingly, in addition to locating computer users that have common interest circles with the requesting computer user (in addition to an interest circle directed to the query topic), the search engine **110** may also include computer users that do not have a threshold commonality of interest circles with the requesting computer user but for other reasons (authority, expert, popularity, etc.) are included in the group **401** of computer users who have an interest circle pertaining to the query topic.

It should be appreciated that in addition to having an interest circle directed to the query topic, the group **401** of computer users will also have other interest circles, some of which may or may not be shared in common with the requesting computer user. Advantageously, inferences may be made based on the interest circles of the group **401** of computer users. Continuing the example of FIG. 4, the requesting computer user **101** does not have an interest circle corresponding to "fishing in New Zealand" and, as such, the group **401** of computer users is identified that do share an interest circle **408** for the topic. In addition to the interest circle **408** for "fishing in New Zealand," this group also includes an interest circle **410** for "travel" and, as a sub-topic, an interest circle **412** for "travel in New Zealand." Based on these factors, the search engine **110** can make an inference that, in addition to information on "fishing in New Zealand", computer user **101** may also wish to receive information regarding traveling to New Zealand and supply include search results related to this latter topic in the response to the computer user's search query. Similar to the above, inferences may often best be determined from a group **401** of computer users that have a high threshold of commonality with regard to interest circles, but this may be countered with computer users that are experts in or authorities to a particular inferred topic.

Turning now to FIG. 5, this figure is a flow diagram illustrating an exemplary routine **500** for processing the network navigation data **202** of a computer user **101** into one or more interest circles corresponding to the computer user. Beginning at block **502**, the network navigation data **202** for the computer user **101** is received. As mentioned above, the network navigation data **202** may include (by way of illustration and not limitation) network locations to which the computer user **101** has navigated (e.g., via a browser on a computing device, such as computing device **102**); search queries submitted to a search engine **110**; activity conducted at various

network sites, such as purchases, examinations of details and related items, and the like; storage and retrieval of network content; and the like.

Using the network navigation data **202** (as well as other available information related to the computer user, such as a user profile), at block **504** the interest circles generator **204** analyzes and evaluates the network navigation data **202** to identify various topics. In addition to the network navigation data **202**, the interest circles generator **204** may retrieve the existing interest circles **208** corresponding to the computer user **101** that are maintained in the interest circles store **206**. If a set of interest circles **208** exists for the computer user **101**, this may serve as a basis for the evaluation/analysis of the network navigation data **202**.

As part of analyzing the network navigation data **202**, the interest circles generator **204** may retrieve the content of the various network sites and mine the content to identify one or more topics. According to aspects of the disclosed subject matter, analyzing and mining the network navigation data may involve any number of heuristics including, but not limited to: computer-learning; data clustering; data analysis based on term frequency and inverse document frequency; and the like. The network sites (as well as other data that is included in the network navigation data **202**) are associated with the identified topics which then become interest circles for the computer user. The number of visits to a particular network site (or a particular section of a network site), the amount of times the computer user spends with regard to a network site, the type and number of actions that the computer user makes at the network site, as well as other criteria, may be captured with regard to the interest circle such that some network sites in the interest circle are considered more important (or of higher relevancy) to the interest circle's topic and/or to the computer user.

Once the analysis of the network navigation data **202** is complete, at block **506** the interest circles generator **204** stores the set of interest circles **208** for the computer user **101** in an interest circles store **206**. As part of storing the set of interest circles, the various topics (and sub-topics) of the interest circles in associate with the computer user may be stored and/or indexed such that the information may be found in regard to satisfying a search query from another user. At block **508**, according to at least one non-exclusive embodiment and as indicated above, while the set of interest circles **208** is associated with the computer user **101**, the set of interest circles is stored such that personal identifying information is obscured. In an alternative embodiment (not shown), the personal identifying information is not obscured on storage but all personal identifying information is obscured as the set of interest circles is accessed in regard to satisfying a search query from another computer user. Thereafter, the routine **500** terminates.

Once interest circles for a variety of computer users are established and stored in the interest circles store **206**, the search engine **110** can improve search results by accessing them. FIG. **6** is a flow diagram illustrating an exemplary routine **600** for responding to a search query from a requesting computer user **101** with search results having improved relevancy according to the interest circles of other computer users. Beginning at block **602**, the search engine **110** receives a search query from a requesting computer user, such as computer user **101**. At block **604**, the search engine **110** identifies a plurality of search results that are responsive to the search query.

At decision block **606**, a determination is made as to whether the requesting computer user has an established interest circle with regard to the query topic. If not, the routine

**600** proceeds to block **608**. At block **608**, a set of computer users having an interest circle corresponding to the query topic are identified. As mentioned above, this set or group **401** of computer users may be selected according to those that have common interest circles, including those that have common interest circles above a predetermined threshold. Additionally, members of the group **401** of computer users may also be selected based on the fact that they are an authority on the query topic.

At block **610**, the identified search results are ranked and/or ordered, at least in part, according to the interest circles corresponding to the query topic of the identified group **401** of computer users. Ranking or ordering search results according to the interest circles corresponding to the query topic of the identified group **401** of computer users may include determining the most popular network sites (which correspond to search results) in the interest circle, the sites that have the most activity, and so on. For purposes of clarity, the higher ranked or ordered search results are viewed as the more relevant search results with regard to the query topic.

At block **612**, the search engine **110** generates one or more search results pages from the ranked and/or ordered search results. At block **614**, one or more search results pages are returned to the requesting computer user in response to the search query. Thereafter, the routine **600** terminates.

In the alternative to the requesting computer user not having an interest circle corresponding to the query topic, if the computer user does have an interest circle corresponding to the query topic the routine **600** proceeds from decision block **610** to block **616**. At block **616**, the identified search results are ranked, at least in part, according to the information in the requesting computer user's interest circle corresponding to the query topic. At block **618**, the search engine **110** generates one or more search results pages from the ranked and/or ordered search results. At block **620**, one or more search results pages are returned to the requesting computer user in response to the search query. Thereafter, the routine **600** terminates.

As yet an alternative embodiment of routine **600** (not shown), even if the requesting computer user has an established interest circle corresponding to the query topic, the search engine may proceed to block **608** in identifying a group **401** of computer users having an interest circle corresponding to the query topic. However, in this alternative embodiment, the group **401** of computer users will include the requesting computer user. This alternative embodiment may be implemented when the interest circle of the requesting computer user corresponding to the query topic does not include sufficient data to meet a predetermined threshold.

Regarding routines **500** and **600**, it should be appreciated that while these routines are expressed in regard to discrete steps, these steps should be viewed as being logical in nature and may or may not correspond to any actual and/or discrete steps. Nor should the order that these steps are presented in the various, illustrative routines be construed as the only order in which the steps may be carried out. Indeed, while these routines include various novel features of the disclosed subject matter, other steps (not listed) may also be carried out in the execution of the routines. Further, those skilled in the art will appreciate that logical steps of these routines may be combined together or be comprised of multiple steps. Steps of routines **500** and **600** may be carried out in parallel or in series. Often, but not exclusively, the functionality of the various routines is embodied in software (e.g., applications, system services, libraries, and the like) that is executed on computer hardware and/or systems described below in regard to FIG. **700**.

Additionally, while many novel aspects of the disclosed subject matter are expressed in routines, applications (also referred to as computer programs), and/or methods, these aspects may also be embodied as computer-executable instructions stored in computer-readable media (also referred to as computer-readable storage media). As those skilled in the art will appreciate, computer-readable media can host computer-executable instructions for later retrieval and execution. When executed on a computing device, the computer-executable instructions stored on one or more computer-readable storage devices carry out various steps, methods and/or functionality, including those steps, methods, and routines described above in regard to routines 500 and 600. Examples of computer-readable media include, but are not limited to: optical storage media such as Blu-ray discs, digital video discs (DVDs), compact discs (CDs), optical disc cartridges, and the like; magnetic storage media including hard disk drives, floppy disks, magnetic tape, and the like; memory storage devices such as random access memory (RAM), read-only memory (ROM), memory cards, thumb drives, and the like; cloud storage (i.e., an online storage service); and the like. For purposes of this disclosure, however, computer-readable media expressly excludes carrier waves and propagated signals.

Turning now to FIG. 7, this figure is a block diagram illustrating an exemplary search engine 100 configured according to aspects of the disclosed subject matter, particularly for providing improved search results to a search query based on (at least in part) interest circles. The search engine 700 includes a processor 702 (or processing unit) and a memory 704 interconnected by way of a system bus 710. As those skilled in the art will appreciate, memory 704 typically (but not always) comprises both volatile memory 706 and non-volatile memory 708. Volatile memory 706 retains or stores information so long as the memory is supplied with power. In contrast, non-volatile memory 708 is capable of storing (or persisting) information even when a power supply is not available. Generally speaking, RAM and CPU cache memory are examples of volatile memory whereas ROM and memory cards are examples of non-volatile memory.

The processor 702 executes instructions retrieved from the memory 704 in carrying out various functions, particularly in responding to search queries with improved search results based, at least in part, on interest circles. The processor 702 may be comprised of any of various commercially available processors such as single-processor, multi-processor, single-core units, and multi-core units. Moreover, those skilled in the art will appreciate that the novel aspects of the disclosed subject matter may be practiced with other computer system configurations, including but not limited to: mini-computers; mainframe computers, personal computers (e.g., desktop computers, laptop computers, tablet computers, etc.); handheld computing devices such as smartphones, personal digital assistants, and the like; microprocessor-based or program-mable consumer electronics; and the like.

The system bus 710 provides an interface for search engine's components to inter-communicate. The system bus 710 can be of any of several types of bus structures that can interconnect the various components (including both internal and external components). The illustrative search engine 110 further includes a network communication component 712 for interconnecting the search engine with other computers (such as user computers 102-106 and networking sites 112-116) as well as other devices on a computer network 108. The network communication component 712 may be configured to communicate with an external network, such as network 108, via a wired connection, a wireless connection, or both.

The search results retrieval component 714 identifies search results responsive to the search engine 110 receiving a search query from a computer user 101. The search engine 110 identifies the search results according to information in the content store 722. The content store 722 includes information regarding content distributed throughout many locations on the network 108. Typically, but not exclusively, the content store is indexed according to many keys which may include the query topic of the search query.

The search results page generator 716 generates one or more search results pages that may be presented to the requesting computer user 101 in response to the received search query. The search results page generator 610 generates the search results pages based on the search results identified by the search results retrieval component 608 after they have been ranked and/or ordered, at least in part, according to the search results ranking component 718. The search results ranking component 718 is responsible for identifying a group 401 of computer users having interest circles corresponding to the query topic of the received search query and ranking the identified search results according to the interest circles. The search results ranking component 718 may operate in conjunction with the interest circles generator 204 in identifying the group 401 of computer users having interest circles corresponding to the query topic of the received search query.

The interest circles generator 204, as described above, is responsible (at least in part) for evaluating, analyzing, and mining the network navigation data 202 of each of a plurality of computer users, and storing the generated sets 720 of interest circles in the interest circles store 206. While the interest circles content store 206 and the content store 722 are identified as separate components, this is for descriptive purposes and may or may not correspond to an actual embodiment. In at least one embodiment, the interest circles content store 206 is included within the content store 722.

Those skilled in the art will appreciate that the various components described above, including the interest circles generator 204, the search results retrieval component 714, the search results page generator 716, and the search results ranking component 718 may be implemented as executable software modules within the search engines 110, as executable hardware modules, or a combination of the two. Moreover, each of the various components may be implemented as an independent, cooperative process or device, operating in conjunction with the search engine 110. It should be further appreciated, of course, that the various components described above in regard to the search engine 110 should be viewed as logical components for carrying out the various described functions. As those skilled in the art appreciate, logical components (or subsystems) may or may not correspond directly in a one-to-one manner to actual components. In an actual embodiment, the various components identified as being part of the search engine 110 in FIG. 7 may be combined together or broke up across multiple actual components and/or implemented as cooperative processes on a computer network 108.

As indicated above, interest circles for a particular computer user are formed from the navigation data 202 gathered for the computer user. Moreover, the interest circles may be generated by an interest circles generator 204 located remotely from the computer user's computing device, such as described above in regard to FIG. 7, or on the computer user's computing device and provided to the search engine 110 for storage in the interest circles store 206. To that end, FIG. 8 is a block diagram illustrating a computer user's computing device 800 configured to track navigation data of the computer user as well as generate interest circles for the computer user. The computing device 800 includes a processor 802 (or

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processing unit) and a memory **804** interconnected by way of a system bus **810**. As discussed above in regard to FIG. 7, memory **804** typically (but not always) comprises both volatile memory **806** and non-volatile memory **808**. Volatile memory **806** retains or stores information so long as the memory is supplied with power. In contrast, non-volatile memory **808** is capable of storing (or persisting) information even when a power supply is not available. Generally speaking, RAM and CPU cache memory are examples of volatile memory whereas ROM and memory cards are examples of non-volatile memory.

The processor **802** executes instructions retrieved from the memory **804** in carrying out various functions, including tracking navigation information of the computer user to generate navigation data **202** as well as generating interest circles **208** by way of an interest circles generator **204**, such as described above. The computing device **800** further includes a network communication component **812** for interconnecting the device with other computers (such as user computers **102-106**, search engine **110**, and networking sites **112-116**) as well as other devices on a computer network **108**. The network communication component **812** may be configured to communicate with an external network, such as network **108**, via a wired connection, a wireless connection, or both.

The computing device **800** also includes a network browsing component **814**. The network browsing component **814** is that component through which the computer user is able to navigate to various sites on the network **108**. The network browsing component **814** may be implemented as a hardware component or as an executable software component. One example of a software-implemented network browsing component **814** includes Microsoft Corporation's Internet Explorer®. Also included in the computing device **800** is a network data tracking component **816**. The network data tracking component **816** tracks the navigation information of the computer user (working in conjunction with the network browsing component **814**) and stores the navigation data **202** in a data store **818**. Still further included in the computing device **800** is an interest circles generator **204** that digests the network navigation data **202** and generates one or more interest circles **208** for the computer user. In this configuration, the interest circles are provided to a central location, such as the interest circles store **206** (of FIG. 7) such that the search engine **110** can draw upon them in responding to search queries for other computer users.

As with the search engine **110** shown in FIG. 7, the various components described above for the computer device **800**, including the interest circles generator **204** and the network data tracking component **816** may be implemented as executable software modules within the computing device **800**, as executable hardware modules, or a combination of the two. It should be further appreciated, of course, that the various components described above in regard to the computing device **800** should be viewed as logical components for carrying out the various described functions. As those skilled in the art appreciate, logical components (or subsystems) may or may not correspond directly in a one-to-one manner to actual components.

While various novel aspects of the disclosed subject matter have been described, it should be appreciated that these aspects are exemplary and should not be construed as limiting. Variations and alterations to the various aspects may be made without departing from the scope of the disclosed subject matter.

What is claimed:

1. A computer-implemented method for responding to a search query from a user, the method comprising:

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receiving a search query from a requesting computer user, the search query being directed to a query topic;  
obtaining a set of search results responsive to the search query; and

determining whether the requesting computer has an interest circle corresponding to the query topic and, upon determining the condition that the requesting computer user does not have an interest circle corresponding to the query topic:

identifying a plurality of computer users, each of the plurality of computer users having an established interest circle corresponding to the query topic, wherein identifying the plurality of computer users comprises identifying the plurality of computer users irrespective of any user-established relationship with the requesting computer user;

ordering the set of search results according to the interest circles of the identified plurality of computer users; and

returning higher ordered search results to the requesting computer user.

2. The computer-implemented method of claim 1, identifying the plurality of computer users comprises identifying the plurality of computer users according to each of the plurality of computer users having an established interest circle corresponding to the query topic and a commonality between interest circles of each of the plurality of computer users and interest circles of the requesting computer user.

3. The computer-implemented method of claim 2, wherein the commonality between the interest circles of each of the plurality of computer users and interest circles of the requesting computer user exceeds a predetermined threshold of similarity.

4. The computer-implemented method of claim 1, wherein the requesting computer user does not have an interest circle corresponding to the query topic.

5. The computer-implemented method of claim 1, wherein ordering the set of search results comprises ordering the set of search results according to the interest circles of the identified plurality of computer users and according to an interest circle of the requesting computer user corresponding to the query topic.

6. The computer-implemented method of claim 1, further comprising:

obtaining network navigation data of a second plurality of computer users; and

for each of the second plurality of computer users:

identifying a set of interest circles corresponding to the computer user based on the computer user's network navigation data; and

storing the set of interest circles in an interest circles store in association with the computer user.

7. The computer-implemented method of claim 1 further comprises inferring at least one additional search result according to an additional interest circle of at least one computer user of the identified plurality of computer users, wherein the requesting computer user does not have an established interest circle corresponding to the additional interest circle of the at least one computer user; and

wherein returning higher ordered search results to the requesting computer user comprises returning higher ordered search results to the requesting computer user and the at least one additional search result.

8. A computer-readable medium bearing computer-executable instructions which, when executed on a computing system comprising at least a processor executing instructions



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retrieved from the medium, carry out a method for responding to a search query from a user, the method comprising:

obtaining network navigation data of a first plurality of computer users, and for each of the first plurality of computer users:

identifying a set of interest circles corresponding to the computer user based on the computer user's network navigation data; and

storing the set of interest circles in an interest circles store in association with the computer user; receiving a search query from a requesting computer user, the search query being directed to a query topic;

obtaining a set of search results responsive to the search query; and

determining whether the requesting user has an interest circle corresponding to the query topic and, upon the condition of determining that the requesting user does not have an interest circle corresponding to the query topic:

identifying a second plurality of computer users, each of the second plurality of computer users being identified as having an established interest circle corresponding to the query topic, wherein identifying the second plurality of computer users comprises identifying the second plurality of computer users irrespective of any user-established relationship with the requesting computer user;

ordering the set of search results according to the interest circles of the identified second plurality of computer users; and

returning higher ordered search results to the requesting computer user.

9. The computer-readable medium of claim 8, wherein identifying the second plurality of computer users comprises identifying the second plurality of computer users as having an established interest circle corresponding to the query topic and a commonality between interest circles of each of the second plurality of computer users and interest circles of the requesting computer user.

10. The computer-readable medium of claim 9, wherein the commonality between the interest circles of each of the second plurality of computer users and interest circles of the requesting computer user exceeds a predetermined threshold of similarity.

11. The computer-readable medium of claim 8, wherein the requesting computer user does not have an interest circle corresponding to the query topic.

12. The computer-readable medium of claim 8, wherein ordering the set of search results comprises ordering the set of search results according to the interest circles of the identified second plurality of computer users and according to an interest circle of the requesting computer user corresponding to the query topic.

13. The computer-readable medium of claim 8, wherein the requesting computer user is one of the first plurality of computer users.

14. The computer-readable medium of claim 8, wherein the method further comprises inferring at least one additional search result according to an additional interest circle of at least one computer user of the identified second plurality of computer users, wherein the requesting computer user does not have an established interest circle corresponding to the additional interest circle of the at least one computer user; and

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wherein returning higher ordered search results to the requesting computer user comprises returning higher ordered search results to the requesting computer user and the at least one additional search result.

15. A computer system for responding to a search query with search results, the system comprising a processor and a memory, wherein the processor executes instructions stored in the memory as part of or in conjunction with additional components to respond to a search query, the additional components comprising:

a network communication component configured to receive queries over a network and respond to the queries with search results;

a search results retrieval component that identifies a plurality of search results responsive to a query topic of the search query; and

a search results ranking component that is configured to: determine whether a requesting user has an interest circle corresponding to the query topic of the search query and, upon the condition that the requesting user does not have an interest circle corresponding to the query topic:

identify a plurality of computer users, wherein each of the plurality of computer users is identified as having an established interest circle corresponding to the query topic of the search query, and wherein identifying the plurality of computer users comprises identifying the plurality of computer users irrespective of any user-established relationship with the requesting computer user; and

order the set of search results according to the interest circles of the identified plurality of computer users; and

a search results page generator that generates one or more search results pages according to the higher ordered search results and returns the one or more search results pages to the requesting computer user.

16. The computer system of claim 15 further comprising: an interest circles generator configured to: obtain network navigation data for a second plurality of computer users; and for each of the second plurality of computer users: process the network navigation data for the computer user into a corresponding set of interest circles for the computer user; and store the set of interest circles for the computer user in an interest circles store in association with the computer user.

17. The computer system of claim 15, wherein search results ranking component is further configured to:

infer at least one additional search result according to an additional interest circle of at least one computer user of the identified plurality of computer users, wherein the requesting computer user does not have an established interest circle corresponding to the additional interest circle of the at least one computer user; and

wherein returning higher ordered search results to the requesting computer user comprises returning higher ordered search results to the requesting computer user and the at least one additional search result.

18. The computer system of claim 15, wherein the search results ranking component identifies the plurality of computer users as having an established interest circle corresponding to the query topic and a commonality between interest circles of each of the plurality of computer users and interest circles of the requesting computer user.

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